

The application of the polarized neutron techniques at the China Spallation Neutron Source beamlines

Polarized neutrons play an indispensable role in neutron scattering research, and have been incorporated into various neutron diffractometers and spectrometers. Recognizing the importance of polarized neutrons, the China Spallation Neutron Source (CSNS) has dedicated resources for developing its own capabilities for polarized neutron techniques to meet the requirements of its beamlines. Based on the established neutron technology development beamline BL-20 at CSNS, the characterization of neutron spin filter cells manufactured at CSNS, the calibration of self-developed polarized neutron instruments and performance of the polarized neutron technique applied to beamlines have been accomplished. In addition, the on-site test of the replacement of in-situ ^3He neutron spin filter (NSF) as the polarization analyzer of the Multi-Purpose Reflectometer has approved that, the self-developed ^3He NSF is qualified for the regular measurements with magnetic thin films, whose cell parameters can be optimized depending on the wavelength range. The designs for the polarization analyzed small-angle neutron scattering (PASANS) were also carried out for the Very Small Angle Neutron Scattering instrument at CSNS. Different setups combined with magnet (weak field with 2 mT, or strong with 2 T along vertical direction) - Cryostat (1.8 K) sample environments and PASANS ability have been optimized to cover the experimental requirements related to organics or magnetic nanoparticles. This work demonstrates the capability of CSNS to develop time-of-flight polarized neutron techniques in-house.

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